

# What Can We Do to Reduce the Impact of Floods?

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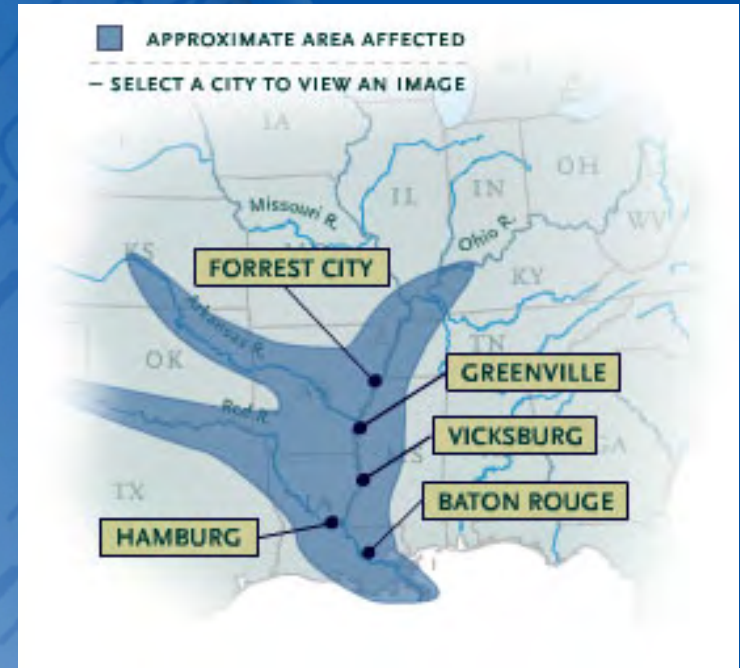
# Historical highlights of flood management attempts

- 1726 first New Orleans Levees
- 1879 Mississippi River Commission – ‘Levees only’ policy
- The Great Flood of 1927  
3 M CFS – overpowers levees



# Mark Twain wrote:

➤ *"little European river... it would just be a holiday job... to wall it, and pile it, and dike it, and tame it down, and boss it around... But this ain't that kind of a river."*



# Corps of Engineers: Flood Control Dams

The West Coast of South Carolina:

➤ Corps

Lake Hartwell, Lake Russell,  
Lake Thurmond

➤ Duke Power

Lake Jocassee, Lake Keowee

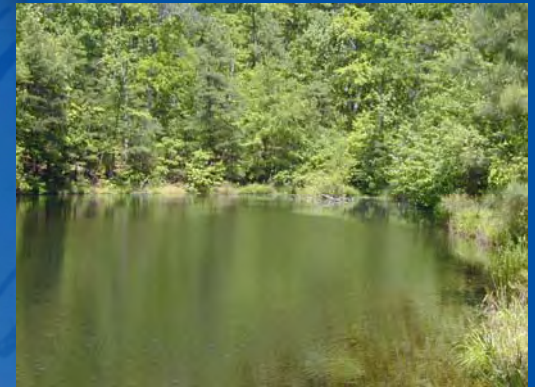
➤ Georgia Power

Lake Yonah, Lake Tallulah



# Soil Conservation Service and Flood Control

- Early efforts by the Soil Conservation Service for small rural watersheds established much of the methodology used in calculating detention and impacts of development
- Utilized a theory of upstream management along with downstream “channel improvements”
- When a watershed was developed in this manner flood mitigation was effective however other effects on wildlife and water quality generally discredited the “channelization” theory.



# Common Sense in Action

Early settlements on the Reedy River flooded, so early residents of Greenville moved to high ground leaving river front parks as their legacy.



# Local flood management prior to 1970's

- Little legal sanction or public support for cities and counties to restrict construction along rivers and streams – Oconee River in Georgia, Brushy Creek in Greenville
- Very little scientific data broadly available for establishing “flood levels”
- Focus on dams, levees, channels



# Federal Emergency Management Agency

Created F.I.R.M. Maps  
beginning in the  
1970's

- Utilized U.S.G.S. mapping – the best available
- Major streams – cross-sections surveyed

- Local administration
- Flood insurance as the incentive



# FEMA Regulations

- Federal Insurance Rate Maps (F.I.R.M)
- 100 year flood plain
- Floodway
- Permits for fill
- Finish Floor Elevation above Flood Level



# Problems with FEMA mapping

- Accepted as inerrant law by banks and insurance companies
- Often very approximate
- False sense of security if “not in flood plain” on map

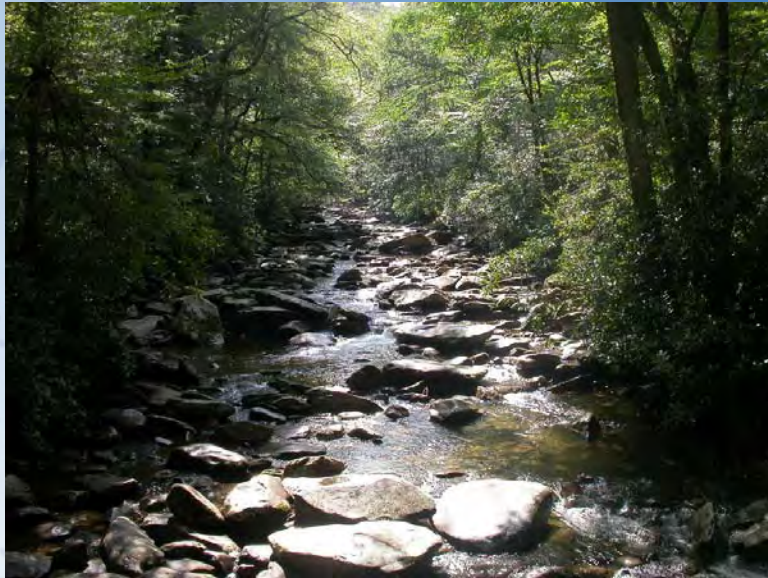


# Dealing with floodplains

- FEMA regulations– administered by Cities and Counties
- No fill in “floodway”, if floodway not known, calculate “no rise”
- Some jurisdictions “no fill without equal cut”
- Finish floor of buildings must be above Base Flood (100 year flood level) as shown on map, if not shown must be calculated which is often expensive for small property owners
- Many cities say 1 foot, Greenville County says 4 feet above



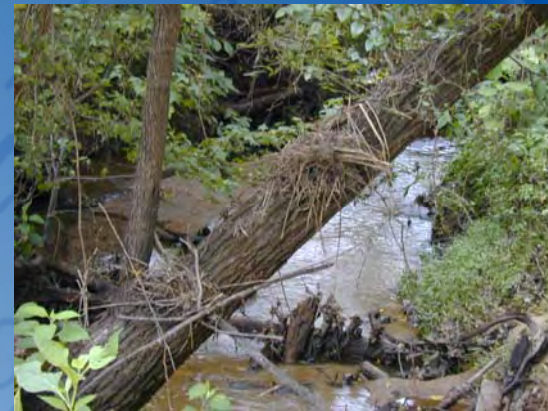
# Other floodplains



- Smaller unregulated streams still flood
- Many owners strangely ignorant of flooding
- Backwaters from roads and other obstructions

# Dealing with non-FEMA floodplains

- Banks, insurance companies, and uninformed architects don't recognize them
- In upstate SC: Greenville County regulates them
- Important to recognize and inform client



# Flooding Problems

- Del Norte: built before flood regulations
- Gilder Creek: floodplain changes since original map
- Hunters Creek in Greenwood, non-FEMA floodplain



# Coastal Flooding and Flood Zones

- Mississippi Coast Flood Zones set by Hurricane Camille flood levels— the best data available
- Many residents did not have insurance and stayed with their homes based on that data
- Many of those homes were completely destroyed this time — with no insurance



# Hydrology is an imperfect science

- SCS research underlies most of small watershed hydrology
- TR55 calculations generally accepted by regulatory bodies
- Corps of Engineers- HEC programs are utilized for larger basins
- It is very difficult to correlate the two methodologies to determine the most likely flood level



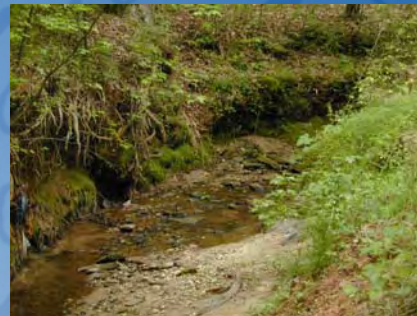
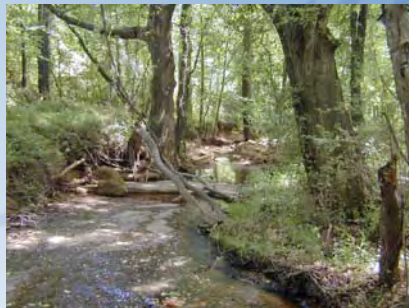
# The difficulties in floodplain & stormwater mangement

- Creeks and rivers don't honor political boundaries
- the Enoree runs through Greenville and Spartanburg Counties and the City of Greer,
- the Saluda is regulated by Pickens, Anderson, and Greenville Counties,
- the Reedy leaves Greenville County into the City and back again
- All of that is just between the NC line and I-85!



# The difficulties in floodplain & stormwater management

- For years the City and County of Greenville insisted on using different rainfalls as the standard for calculation as well as differing methodologies for detention.
- Fortunately in 1993 they worked together on collaborative stormwater regulations and agreed on storms and methodologies, but over the years the administration of the rules has varied.



# The difficulties in floodplain & stormwater management

- One project was annexed into Travelers Rest went from a FEMA flood zone into a community with no flood program or insurance – City Council enacted an ordinance in response
- One project annexed into Fountain Inn had a 100 foot difference in the width of the floodplain on one stream between the City and County FIRM maps



# The difficulties in floodplain & stormwater management

- Often flood plain regulations are administered out of Building Codes offices that in many jurisdictions don't have engineers or hydrologists.
- In Greenville County alone stormwater and floodplain management is handled by three different departments, Public Works, Soil & Water, and Building Codes



# Proposed Solutions

- “Let floodplains be floodplains”
- Local government would purchase homes and properties currently in flood zones
- Encourage buffer zones from streams



# Buffer Zones

- Flood protection,
- Wetlands mitigation,
- Aesthetics,
- Water Quality,
- May coincide with floodplains,
- Can serve as greenways and parks for recreation



# Plus and minus of detention

- Theory to release water at predevelopment rates
- Why were most detention ponds empty during Tropical Storm Jerry?
- Time of concentration



# Stormwater Management v. wetlands



- In-stream dams are often the best detention
- But wetlands reviewers oppose in-stream dams
- Dikes that provide detention while allowing free flow of streams are a possibility



# Proposed Solutions

- Use updated mapping to restudy all streams and set new flood boundaries and levels
- Greenville City and County have been proceeding with this effort
- Establish watershed or basin management that coordinates local government efforts



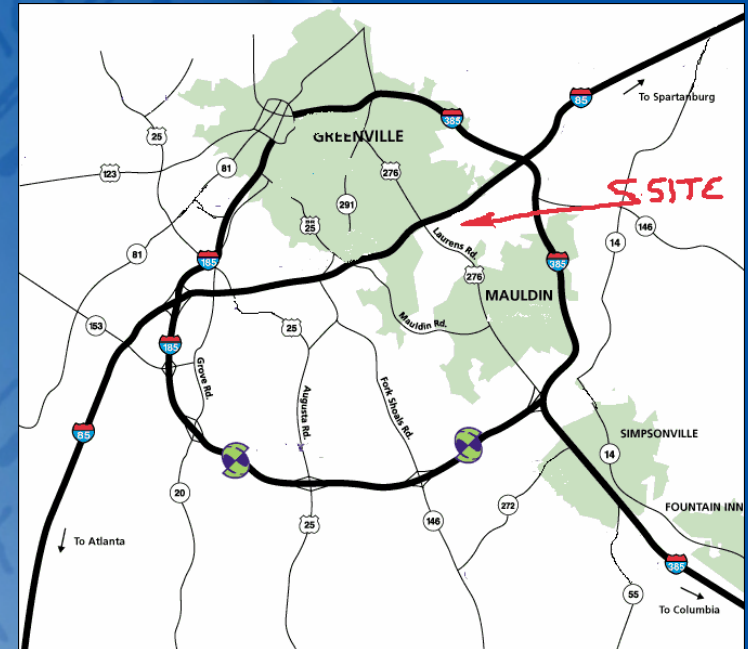
# A Bridge to the Future

- Develop computer models of all streams in developing areas to coordinate the efforts of all the communities and engineers in calculating and mitigating impacts
- Establish basinwide master plans for stormwater management for engineers and developers to use



# I.C.A.R., a Basin Model

- Clemson I.C.A.R. – DHEC and State Engineer regulatory process for development
- Millenium Campus (sharing same basin) – City of Greenville regulatory process
- Calculations of entire 500 acres showed that one detention pond, strategically place could provide detention for all development on both campuses
- All entities agreed to work together and City of Greenville was delegated authority to regulate stormwater issues for the State buildings and monitor the overall adherence to the plan.



# I.C.A.R., a Basin Model

All entities agreed to work together and the City of Greenville was delegated authority to regulate stormwater issues for the State buildings and monitor the overall adherence to the plan which included:

- Protection of floodplains and wetlands
- Greenway recreation
- Shared, coordinated detention



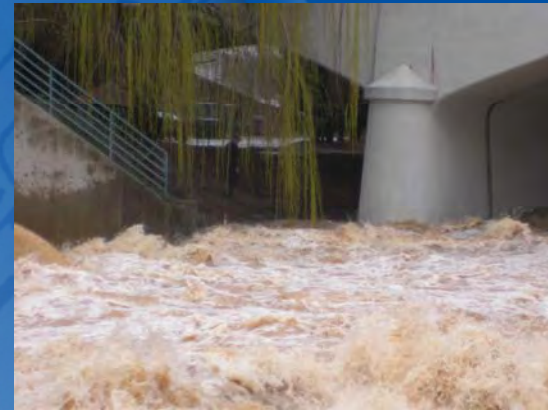
# Handling rural watersheds

- Often “unnumbered A zones”  
poor data
- Small, low profile  
governments – high regard for  
private property
- Use economic incentives and  
education
- Don't place the burden of  
calculation on small property  
owners



# Floodplains & economic incentives

- Provide economic incentives for floodplain protection
- Waive onsite detention with developer fees to be used for regional detention and floodplain acquisition
- Tax breaks for buffer zones, cluster zoning ordinances to allow equitable economic return
- Storm water utility fees



# Floodplains & education

- Floods are natural phenomena
- Good development may change characteristics, but does not cause floods
- Find a better term than “100 year storm”
- Water runs downhill



# Be prepared for storms

- Varied rainfall and flooding are a natural phenomena
- Homes and businesses new and existing change the hydrology
- Basinwide planning and hydrologic models can mitigate this
- Strong emphasis on buffer zones and floodplain protection

